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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/527,790	01/06/2006	Aiichirou Sasaki	44471/313606	7591

23370 7590 03/18/2008

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EXAMINER	
SLOMSKI, REBECCA	

ART UNIT	PAPER NUMBER
2877	

MAIL DATE	DELIVERY MODE
03/18/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/527,790	SASAKI ET AL.	
	Examiner	Art Unit	
	REBECCA C. SLOMSKI	2877	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 March 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-34* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5 and 7-34* is/are rejected.

7)☒ Claim(s) *6* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *14 March 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *3/14/05,3/29/07,3/11/08*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Specification

35 U.S.C. 112, first paragraph, requires the specification to be written in "full, clear, concise, and exact terms." The specification is replete with terms which are not clear, concise and exact. The specification should be revised carefully in order to comply with 35 U.S.C. 112, first paragraph. Examples of some unclear, inexact or verbose terms used in the specification are:

- The variables $\Phi 0$, λ, and L contain no suggestion or description of the measurement units used/necessary for the calculations
- There are multiple variables such as $\Phi 0$ and A0 that require subscript in the notation for clarification purposes.

The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Objections

1. Claim 11 is objected to because of the following informalities: light source (8) is nonexistent. Reference numeral 8 refers to a half wave plate in the specification and figures. Appropriate correction is required.

2. Claims **14-17, 21-25, 28, 29, 31-34** are objected to because they contain the variable Φ0. This notation renders the equations unclear. The examiner understands the variable to be Φ_0. For clarification purposes, appropriate correction is required. Additionally, claims 17, 24, 28, 29, 31, and 32 contain the variables no and ne, also understood to be n_o and n_e respectively.

Claim Rejections - 35 USC § 112

The following is a quotation of the first and second paragraphs of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.
>
> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims **14-17, 21-25, 28, 29,** and **31-34** are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

3. The variables Φ0, λ, and L contain no limitation on the measurement units. One of ordinary skill in the art would be unable to make proper use of this equation without the knowledge of the measurement unit.

4. Additionally, the equation defining Φ0 appears to suggest the use of a radian measurement with the term (2π/λ). If this is so, then the equation n*45° - Φ0/2 would be subtracting radians from degrees, making the result a mixture of radians and degrees.

In order to enable one of ordinary skill in the art, all of the measurement units must be clearly set forth, or expressed in a way such that one of ordinary skill in the art would understand. Additionally, the measurement units should agree and be mathematically enabling. Correction is required.

Claims **18, 19, 20, 26, 27** and **30** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

5. With respect to claims **18, 19, 26** and **27**, the limitation "when the electric field based on the signal under test is not applied, based on the alternate current signal obtained by said detector" is unclear. It is unclear to the examiner and not clarified in the specification what "based on the alternate current signal obtained by said detector" refers to.

6. With respect to claims **20** and **30**, the limitations fail to clarify the issues for which claim 18 is rejected above and stands rejected for the same reason.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1 and **4** are rejected under 35 U.S.C. 102(b) as being anticipated by Mitsuru et al. JP Publication 2003-098205.

7. With respect to claim **1**, Mitsuru et al. discloses a field detecting optical device comprising:

- A light source (Drawing 1, laser diode 21)
- An electro optic crystal which is applied with an electric field based on a signal under test in which a birefringent index changes according to the electric field and which changes a polarization state of light incident from said light source according to the birefringent index and emits the light (Drawing 1, electro optic element 23, P.0014)
- A detector that detects an electrical signal according to the change of the polarization state of the light emitted from said electro optic crystal (Drawing 1, photodiodes 43a and 43b)

- A first electrode that is provided close to said electro optic crystal and that applies the electric field based on the signal under test to said electro optic crystal (Drawing 1, 1st electrode 27)
- A second electrode that is provided close to said electro optic crystal and thereby forming a pair with said first electrode (Drawing 1, 2nd electrode 25)
- An auxiliary electrode that is electrically connected to said second electrode and that forms a capacitance with ground (Drawing 1, ground electrode 31)

8. With respect to claim **4**, Mitsuru discloses all of the limitations as applied to claim 1 above. In addition, Mitsuru discloses:

- Wherein a distance between said auxiliary electrode and second electrode is larger than a distance between said first electrode and second electrode (Drawing 1, distance between electrode 25 and electrode 31 is larger than distance between electrode 25 and electrode 27)

Claims **8-11** are rejected under 35 U.S.C. 102(b) as being anticipated by Ito et al. U.S. Patent #6,624,644.

9. With respect to claim **8**, Ito et al. discloses an electro-optic probe and magneto-optic probe comprising:

- A quarter wave plate that converts a P polarized light and an S polarized light into a circularly polarized light respectively (Figure 1, quarter wave plate 4)
- An electro optic crystal which is applied with an electric field based on a signal under test in which a birefringent index changes according to the electric field and which changes a polarization state of the circularly polarized light from said quarter wave plate according to the birefringent index and emits the light (Figure 1, electro optic element 2, Col. 4, L 40-47)
- A detector that detects an electric signal according to the change of the polarization state of the light emitted from said electro optic crystal (Figure 1, photodiode 12 and 13)
- Reflection light separating means that is positioned at a pre-stage of said quarter wave plate that guides an incident P polarized or S polarized light to said quarter wave plate and that guides an S polarized light or a P polarized light obtained by conversion from a circularly polarized light returned from said electro optic crystal by said quarter wave plate to a direction different from an incident direction of the incident P polarized light or S polarized light (Figure 1, polarizing beam splitter 5, Col.1, L 65- Col.2, L 15)

10. With respect to claim 9, Ito et al. discloses all of the limitations as applied to claim 8 above.

In addition, Ito et al. discloses:

- Said reflection light separating means is a polarizing beam splitter (reference numeral 5 denotes polarizing beam splitter, Col.1, L 45-46)

11. With respect to claim **10**, Ito et al. discloses all of the limitations as applied to claims 8 and 9 above. However, Ito et al. fails to specifically disclose that the polarizing beam splitter transmits a P polarized light and reflects an S polarized light. It is inherent to a polarizing beam splitter that it transmits the P polarized light and reflects the S polarized light. The following references support this inherency: Ando et al. U.S. Patent #5,523,994, Aughton U.S. Patent #4,645,302, Kobayashi et al. U.S. Patent # 5,621,714 and Weber et al. U.S. Publication 2005/0001983.

12. With respect to claim **11**, Ito et al. discloses all of the limitations as applied to claim 8 above. In addition, Ito et al. discloses:

- A light source that is positioned at a pre-stage of said reflection light separating means and that emits either one of a P polarized light and an S polarized light (Figure 1, laser diode 9)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims **2** and **3** are rejected under 35 U.S.C. 103(a) as being unpatentable over Mitsuru et al. JP Publication 2003-098205 in view of Brown U.S. Patent #5,789,846.

13. With respect to claims **2** and **3**, Mitsuru et al. discloses a field detecting optical device comprising all of the limitations as applied to claim 1 above. However, Mitsuru et al. fails to specifically disclose the surface area of the auxiliary electrode is larger than the surface area of the first electrode and the second electrode, as well as the auxiliary electrode is in the shape of a bar, tubular or spherical.

Brown discloses a capacitively coupled ground electrode comprising:

- A first and second electrode (Figure 1, signal electrode and secondary ground electrode S and G')
- An auxiliary electrode that is electrically connected to said second electrode and forms a capacitance with the ground (Figure 1, primary ground electrode G)
- A surface area of said auxiliary electrode is larger than each surface area of said first electrode and second electrode (Figure 1, primary ground G is larger than S and G')
- A shape of said auxiliary electrode is a bar shape (Figure 1, primary ground G)

It would have been obvious to one of ordinary skill in the art at the time the invention was conceived to include an auxiliary electrode (ground electrode) that is larger than a

first and second electrode (signal electrode) since increasing the surface area of the ground electrode in relation to the surface area of the signal electrode increases the capacitance, reducing the impedance, making the connections more cost effective by reducing loss.

Claims **5** and **7** are rejected under 35 U.S.C. 103(a) as being unpatentable over Mitsuru et al. JP Publication 2003-098205

14. With respect to claim **5**, Mitsuru et al. discloses a field detecting optical device comprising all of the limitations as applied to claim 1 above. However, Mitsuru et al. fails to disclose a distance changing means for changing a distance between said auxiliary electrode and second electrode by moving said auxiliary electrode.

It would have been obvious to one of ordinary skill in the art at the time the invention was conceived to change the distance between the auxiliary electrode and second electrode by moving said auxiliary electrode since it has been held that making an old device movable without producing any new and unexpected results involves only routine skill in the art. In re Lindberg, 93 USPQ 23 (CCPA 1952). It would have been desirable to have a distance changing means for moving the auxiliary electrode since being able to place the electrode at varied distances allows for the electric field sensor as a whole to change in size depending

on the space available and to keep the electrodes a distance away from each other dependent upon the voltages being used to avoid electric field cross talk.

15. With respect to claim 7, Mitsuru et al. discloses a field detecting optical device comprising all of the limitations as applied to claim 1 above. However, Mitsuru et al. fails to specifically disclose said auxiliary electrode is insulated from a circuit that constitutes said detector and a circuit that drives said light source.

It would have been obvious to one of ordinary skill in the art at the time the invention was conceived to insulate the auxiliary electrode from the circuits since this is well known in the art and necessary in order to protect the circuit elements from the ground voltage charges of the electrode.

Claim **12** is rejected under 35 U.S.C. 103(a) as being unpatentable over Ito et al. U.S. Patent #6,624,644 in view of Law et al. U.S. Publication 2004/0227942.

16. With respect to claim **12**, Ito et al. discloses an electro-optic probe and magneto-optic probe comprising:

- An electro optic crystal which is applied with an electric field based on a signal under test in which a birefringent index changes according to the electric field and which changes a polarization state of the incident light according to the

birefringent index and emits the light (Figure 1, electro optic element 2, Col. 4, L 40-47)

- A polarizing beam splitter that transmits one of a P polarized light component and an S polarized light component of the light having the changed polarization state which is emitted from said electro optic crystal and that reflects the other of the polarized light components thereby splitting said light having the changed polarization state into the P polarized light component and the S polarized light component (Figure 1, polarized beam splitter 5)
- A quarter wave plate that converts a P polarized light and an S polarized light into a circularly polarized light respectively (Figure 1, quarter wave plate 4)
- A first photo detector that converts the P polarized light component which is converted into the circularly polarized light by said quarter wave plate into an electrical signal (Figure 1, photodiode 13, Col.4, L 44-47)
- A second photo detector that converts the S polarized light component which is converted into the circularly polarized light by said quarter wave plate into an electrical signal (Figure 1, photodiode 12, Col.4, L 44-47)

However, Ito et al. fails to disclose two quarter wave plates that convert the separated S and P polarized light components into circularly polarized light after being split by the polarized beam splitter.

Law et al. discloses an active control of orthogonal polarizations comprising:

- An electro optic crystal which is applied with an electric field based on a signal under test in which a birefringent index changes according to the electric field and which changes a polarization state of the incident light according to the birefringent index and emits the light (Figure 6D, PSM 14D, as described by 14A in P.0034)
- A beam splitter splitting said light having the changed polarization state into the P polarized light component and the S polarized light component (Figure 6D, beam splitter 24)
- A first quarter wave plate that converts a P polarized light component into a circularly polarized light (Figure 6D, quarter wave plate 600)
- A second quarter wave plate that converts a S polarized light component into a circularly polarized light (Figure 6D, quarter wave plate 602)
- A photo detector that converts the P and S polarized light components which is converted into the circularly polarized light by said quarter wave plate into an electrical signal (Figure 6D, light detector 40)

It would have been obvious to one of ordinary skill in the art at the time the invention was conceived to convert the polarized light components into circularly polarized light in two separate beams since this would allow the beams to be more controllable, by

knowing they are circularly polarized rather than the polarization changing in an uncalculated way by the beam splitter. Additionally, the two separate quarter wave plates would give the apparatus increased applications in allowing the two measurements to be carried out separately for two potentially different outcomes. (Law et al, one for amplitude measurement and one for interferometry, Figure 6D, P.0005)

Claim **13** is rejected under 35 U.S.C. 103(a) as being unpatentable over Hiroshi JP Publication 10-132865 in view of Ito et al. U.S. Patent #6,624,644.

17. With respect to claim **13**, Hiroshi discloses a photovoltage electric field sensor comprising:

- A light source (Drawing 1, optical fiber, 8a that draws light from the light source P.0025)
- An electro optic crystal which is applied with an electric field based on a signal under test in which a birefringent index changes according to the electric field, and which changes a polarization state of light incident from said light source according to the birefringent index and emits the light (P.0026, Pockels element 4, P.0023)
- A pair of electrodes for applying the electric field based on the signal under test to said electro optic crystal (P.0026, transparent electrode of a couple, Drawing 2, 9a)

- A detector that obtains an alternate current signal corresponding to an intensity of the polarized light component (P.0027, analyzer 5)
- Compensating means for offsetting a change in a polarization state of the light incident from said light source when the electric field is not applied, due to a natural birefringence held by said electro optic crystal (P.0033, P.0035-P.0036, Table 1, AC ≈ 0mV)

However, Hiroshi fails to disclose a detector that splits the light emitted from said electro optic crystal into a P polarized light component and an S polarized light component and obtains an alternate current signal corresponding to a difference between intensities of the respective polarized light components.

Ito et al. discloses an electro-optic probe comprising:

- A detector that splits the light emitted from said electro optic crystal into a P polarized light component and an S polarized light component and obtains an alternate current signal corresponding to a difference between intensities of the respective polarized light components (Col.2, L 24-35, photodiodes 12 and 13 in conjunction with beam splitters 5 and 7)

It would have been obvious to one of ordinary skill in the art at the time of the invention to use a detector that splits the light into P polarized and S polarized and obtains a different between intensities of the respective polarized light components since

the difference between the two components give information regarding the electric signal as a control versus the interaction of the signal with the sample, giving the measurements utility in finding information regarding the dielectric substance/electro-optic element. (Ito et al. Col.2, L 34-35, Col.2, L 67-Col.3, L 5)

Allowable Subject Matter

Claim **6** is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Citation

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

- Hakogi U.S. Patent # 5,263,102 discloses a polarization independent optical switch
- Chen U.S. Patent # 6,522,456 discloses a dynamic optical filter

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to REBECCA C. SLOMSKI whose telephone number is (571)272-9787. The examiner can normally be reached on Monday through Thursday, 7:30 am - 5:00 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory J. Toatley, Jr. can be reached on 571-272-2059. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/L. G. Lauchman/
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Patent Examiner

rcs